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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/645,349	08/21/2003	Pieter van Rooyen	1772/16131US02	6747

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EXAMINER	
MULL, FRED H	

ART UNIT	PAPER NUMBER
3662	

DATE MAILED: 06/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/645,349	ROOYEN ET AL.	
	Examiner	Art Unit	
	Fred H. Mull	3662	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 May 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *29-33* is/are allowed.

6)☒ Claim(s) *1,5-10,14,15,17,19,20 and 24-28* is/are rejected.

7)☒ Claim(s) *2-4,11-13,16,18,21-23 and 28* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 January 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments on p. 13-15, with respect to the rejection(s) over Ferreol have been fully considered but they are not persuasive. Applicant states Ferreol fails to disclose "generating, as a function of the responses of the M physical antenna elements to the signal, N responses to the signal, respectively associated with N spatial locations along the antenna array, wherein at least one of the N spatial locations is not coincident with a location of any of the M physical antenna elements and is placed at a non-equidistant location between successive physical antenna elements". Applicant then goes on to give a summary of the teachings of Ferreol, but does not specify where the examiner's cited portions of Ferreol fails to teach the quoted limitations. Ferreol teaches M=5 physical antenna elements (circles, Fig. 21), N=5 spatial locations not coincident with a location of any of the M physical antenna elements (stars, Fig. 21), where the N locations are along the two-dimensional array plane, and cannot be considered at a equidistant location between successive physical antenna elements. The responses at each location N are the same as the responses at each location M, so that the responses at N are a function of the responses at M: response(N)=response(M). All of the quoted limitations appear to be taught by Ferreol. In the future, applicant is encouraged to cite a specific limitation or limitations that applicant believes is not taught, and target their argument to that limitation, rather than quoting half the claim.

Applicant's arguments on p. 16-17, with respect to the rejection(s) over Satou have been fully considered but they are not persuasive. Applicant states Satou fails to disclose "wherein the array processing module is configured to generate N signal response values for the antenna array as a function of the M replicas of the received signal; wherein the N signal response values *include at least one virtual antenna response value*, wherein N is greater than M". Applicant apparently argues that none of B_1-B_9 in Fig. 9 represent virtual antenna elements. However, Satou explicitly states that B_1-B_9 includes four virtual antennas (col. 4, line 63 to col. 5, line 14). Here M=5 (5 real antennas) and N=9 (5 real antennas plus 4 virtual antennas), such that N>M (9>5), where N includes at least one (here 4) virtual elements.

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 1, 6-9, 20, and 24-28 are rejected under 35 U.S.C. 102(e) as being anticipated by Ferreol.

In regard to claims 1, 6-8, 20, and 24-27 Ferreol discloses:

receiving M replicas of the signal, each of the M replicas being received by one of a corresponding M physical antenna elements of the antenna array (2, Fig. 1; dots, Fig. 21);

determining M responses of the M physical antenna elements to the signal, each of the M responses corresponding to one of the M physical antenna elements (col. 12, lines 1-21); and

generating, as a function of the responses of the M physical antenna elements to the signal, N responses to the signal, respectively associated with N spatial locations along the antenna array, wherein at least one of the N spatial locations is not coincident with a location of any of the M physical antenna elements (col. 12, lines 18-22; stars, Fig. 21; squares, Fig. 21), where the array is two-dimensional and the N spatial locations are along the two-dimensional array.

Ferreol teaches M=5 physical antenna elements (circles, Fig. 21), N=5 spatial locations not coincident with a location of any of the M physical antenna elements (starts, Fig. 21), where the N locations are along the two-dimensional array plane, and cannot be considered at a equidistant location between successive physical antenna elements. The responses at each location N are the same as the responses at each location M, so that the responses at N are a function of the responses at M: response(N)=response(M).

In regard to claims 9 and 28, Ferreol further discloses the signal complies with a communication protocol selected from the group consisting of: orthogonal frequency division multiplexing (OFDM), time division multiple access (TDMA), code division multiple access (CDMA), gaussian minimum shift keying (GMSK), complementary code keying (CCK), quadrature phase shift keying (QPSK), frequency shift keying (FSK), phase shift keying (PSK), and quadrature amplitude modulation (QAM) (col. 11, line 42).

3. Claims 10, 14-15, 17, and 19 are rejected under 35 U.S.C. 102(e) as being anticipated by Saton.

Saton discloses:

an antenna array including M physical antenna elements, wherein the M physical antenna elements are spatially arranged to receive one of a corresponding M replicas of the signal so as to be capable of generating M replicas of the received signal (A_1 to A_5, Fig. 9); and

an array processing module including M signal processing chains, wherein each of the M signal processing chains is coupled to one of the M physical antenna elements (PS, TR_1 to TR_5);

wherein the array processing module is configured to generate N signal response values for the antenna array as a function of the M replicas of the received signal; wherein the N signal response values include at least one virtual antenna response value, wherein N is greater than M (B_1 to B_9; col. 4, line 63 to col. 5, line 14).

Satou states that B1-B9 includes four virtual antennas (col. 4, line 63 to col. 5, line 14). Here M=5 (5 real antennas) and N=9 (5 real antennas plus 4 virtual antennas), such that N>M (9>5), where N includes at least one (here 4) virtual elements.

Claim Rejections - 35 USC § 103

4. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ferreol.

It is well known to downconvert RF signals to baseband before signal processing.

5. The examiner also finds the following reference(s) relevant:

Green, which teaches an array with real elements and virtual elements where the virtual elements are along the array and non-equidistant between real elements (Fig. 4).

Applicant is encouraged to consider these documents in formulating their response (if one is required) to this action, in order to expedite prosecution of this application.

6. The examiner also finds the following reference(s) relevant, but not prior art:

Davis (Fig. 12; ¶139) and Judd, previously cited, (Fig. 1C-1E; ¶20-33).

Allowable Subject Matter

7. Claim(s) 29-33 is/are allowed.

8. Claim(s) 2-4, 11-13, 16, 18, 21-23, and 28 is/are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fred H. Mull whose telephone number is 571-272-6975. The examiner can normally be reached on Monday through Friday from approximately 9-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas H. Tarcza can be reached on 571-272-6979. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Fred H. Mull
Examiner
Art Unit 3662

fhm

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